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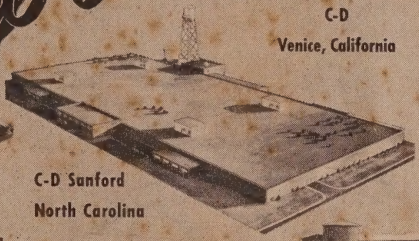

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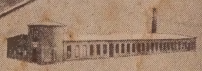

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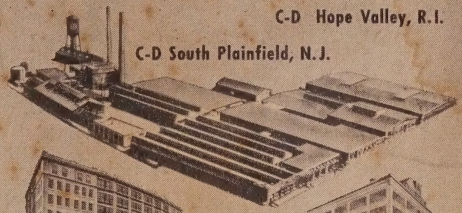

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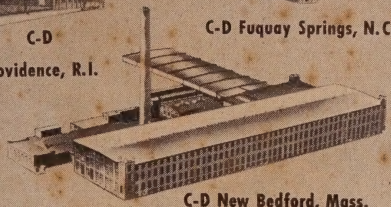

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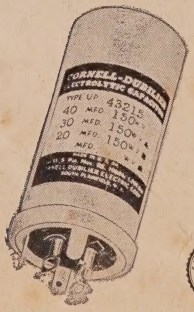

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MODERN SUBSTITUTION BOXES

The substitution box has a long history of usefulness in electronics. The resistor box came first and was followed quickly by the capacitor box. They took their cue from the resistance and capacitance decade boxes of the laboratory. Approximately one generation of technicians has used those two units. From time to time, substitution boxes of other types were devised by experimenters for their own purposes and were publicized but not commercialized.

There are two ways of using a substitution box: In troubleshooting, it can be substituted for a damaged or missing component (and this is how it got its name); or in circuit development work, it can be used to determine the best value for a component. In the first instance, use of the substitution box allows the equipment under test to be restored immediately to operation so that tests may be made. In the second instance, use of the box obviates many calculations or the soldering and unsoldering of many separate trial components.

The utility of the substitution box is due to its adjustable nature. Usually it provides various values of a component in steps obtainable either through a selector switch or a series of terminals. In some instances, however, such as potentiometer or variable capacitor boxes, continuous variation, as well as step-type selection, is provided. One type of substitution box provides separate types of components. Examples of this kind are diode and transistor boxes.

The progress of modern electronic bench work is speeded by substitution boxes of many sorts, some of which are not yet familiar to all technicians. Components of virtually every kind, and networks as well, are switched in these modern boxes. It is interesting to note that transistor substitution boxes have provided the first example of active-component switching. (Vacuum tubes seem to have been neglected in this technique, perhaps for the reason that the tube is an easily-substituted plug-in component itself.) Not all of the modern substitution boxes have been exploited commercially.

Substitution-Box Philosophy

In order successfully and economically to apply the principle of component substitution, the basic philosophy of the substiution box must be considered. The box principles remain substantially the same regardless of the type of component that is switched.

In any substitution box, the components are accessible electrically through either separate terminals (such as binding posts or panel jacks) or through a rotary selector switch. The advantage of a switch is that its use obviates shifting leads externally. However, separate panel terminals for the components are desirable when current levels are too high for a small switch, or when the stray capacitance of a switch would be troublesome.

The mathematical theory of switching might be invoked to analyze the substitution box and to determine its optimum arrangement. However, this approach is beyond the scope of this article, since most of our readers lack

the necessary mathematical background. Instead, the principal configurations of substitution boxes will be shown. These illustrations will serve to answer the question as to how many ways are available for connecting the components inside a substitution box and which is the best way. The principal configurations are shown in Figures 1, 2, and 3 and are discussed in the following paragraphs. In each example, components are represented by

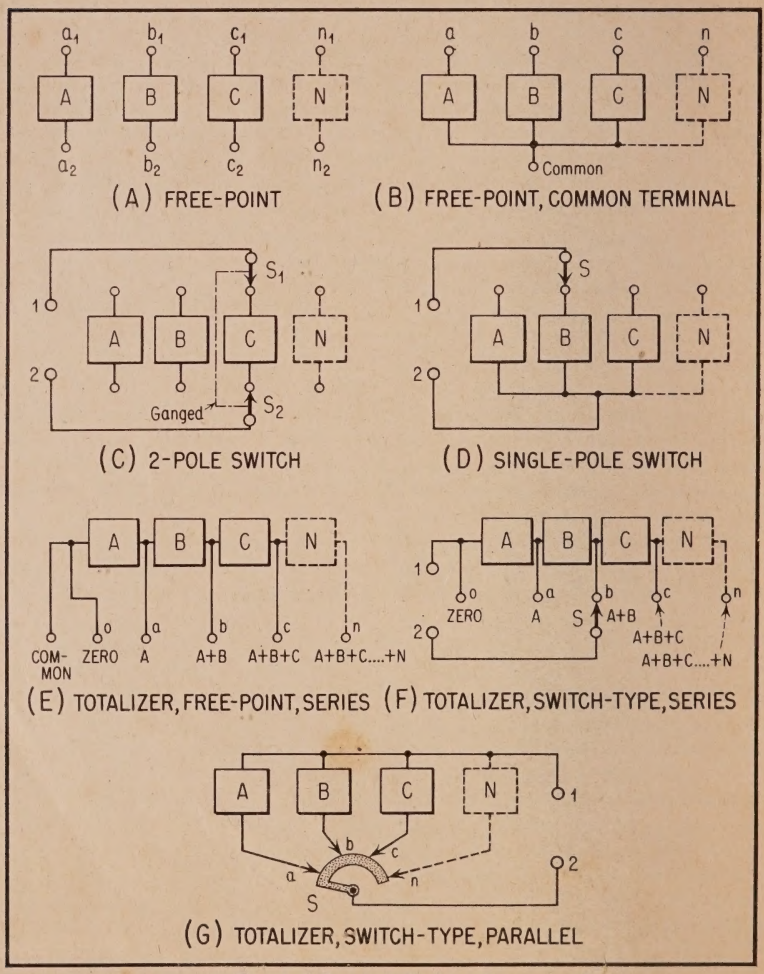


Fig. 1. 2-Terminal Configurations.

blocks, each having the proper number of terminals. The number of components may be extended up to any desired practical limit. The block labelled N represents the nth component in such a series.

2-Terminal Configurations. Examples of 2-terminal units are capacitors, resistors, inductors, diodes, rectifiers, varistors, thermistors, rheostats, varactors, and choke coils. In addition to these single components, two or more such components may be connected in series or parallel to form a network and each such assembly would have two terminals. Figure 1 shows the methods of connecting 2-terminal components.

When both terminals of a component must be separately available, 1(A) or 1(C) may be used. In Figure 1(A), the components are connected between two rows of panel terminals, a_1 to n_1, and a_2 to n_2. External connections are made directly to these terminals. In Figure 1(C), a 2-pole switch (S_1-S_2) is provided for selecting the pairs of component terminals. External connections are made to a single pair of panel terminals (1 and 2).

In many instances, both terminals of each component need not be available separately. Here, one lead of each component may be connected to a single COMMON terminal on the panel, and the opposite leads to separate terminals, as shown in Figure 1(B). The saving in panel terminals afforded by this arrangement is equal to n-1, where n is the number of 2-terminal components. The number of terminals required is n+1. (Compare this with 2n for Figure 1A.)

When one lead of each component may be connected to a single COMMON terminal on the panel, simplicity is obtained also in the switching circuit. Thus, in figure 1(D) the selector switch has only a single pole, resulting in simplified wiring and often in smaller size and lower cost.

When it is desired to add the values of the components in the substitution box, the arrangements shown in Figures 1(E), 1(F), and 1(G) are available. Figures 1(E) and 1(F) show the schemes commonly employed in resistance decade boxes (resistors are added in series), while 1(G) shows the scheme for a capacitance decade box (capacitors are added in parallel). The free-point method of connecting the series components to panel terminals is shown in Figure 1(E), while a switch-type circuit for the series components is shown in Figure 1(F). A short-circuiting switch (S) is required for the parallel-type of totalizer (Figure 1G). The switch is shown in the position in which its shorting sector is connecting together all of the components. The total (A+B+C . . . +N) therefore is available at Terminals 1 and 2.

3-Terminal Configurations. Examples of 3-terminal units are transistors, resistor T-networks, capacitor T-networks, potentiometers, voltage dividers, and attenuators. Additionally, there are many simple component combinations having an input, output, and common terminal which may be incorporated into substitution boxes. These include filters, special-purpose RC and RL combinations, pi networks, resonant circuits, signal peakers, and notch circuits.

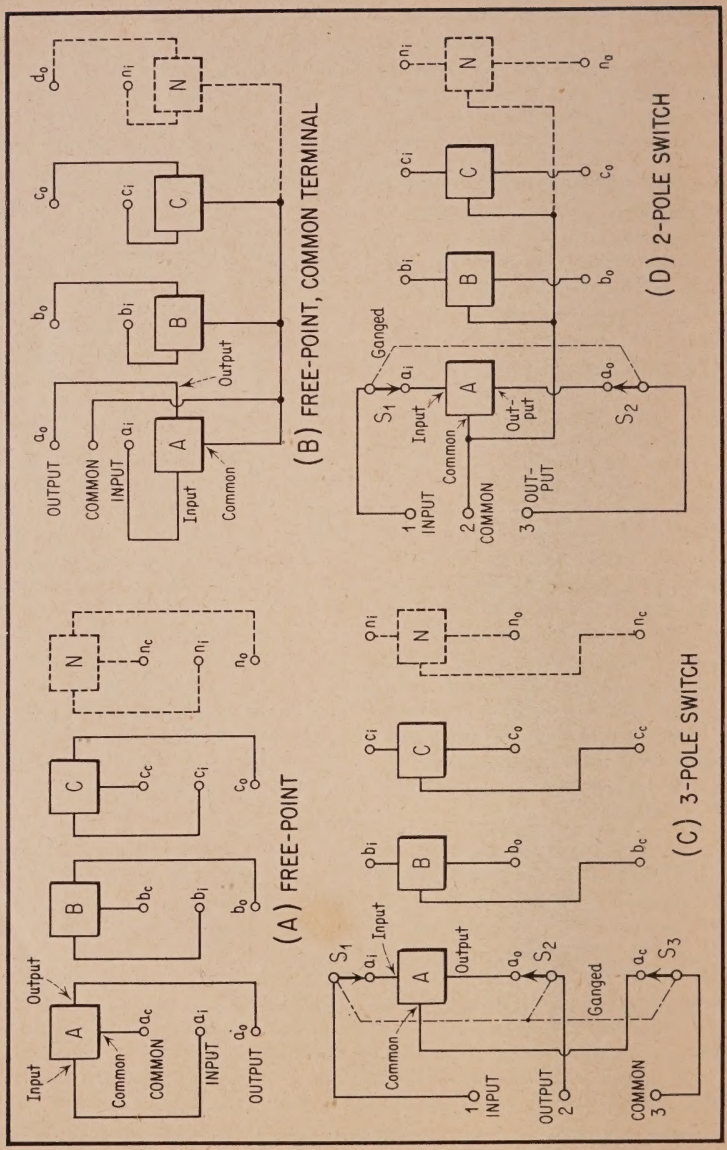


Fig. 2. 3-Terminal Configurations.

Figure 2 shows the principal methods of connecting 3-terminal units in a substitution box. When all three terminals must be accessible externally, 2(A) or 2(C) is available. The free-point scheme (Figure 2A) requires 3n panel binding posts or jacks, where n is the number of components. These terminals are arranged in three rows: a_1 to n_1 for the input, a_o to n_o for the output, and a_c to n_c for the COMMON terminal of each component. When internal switching is permissible and all three terminals must be accessible externally, a 3-pole switch (S_1-S_2-S_3) is required, as shown in Figure 2(C).

When the common terminals of the 3-terminal units may be connected together, the simplified schemes shown in Figures 2(B) and 2(D) are available. In the free-point arrangement (Figure 2B), the number of panel terminals required is equal to 1+2n, where n is the number of 3-terminal units. This is a saving of n-1 over the number of terminals required by the full free-point arrangment (Figure 2A). The panel terminals are arranged in two rows (a_1 to n_1 for the input, and a_o to n_o for the output). A single COMMON terminal on the panel is connected to the common terminal of each component. In the switch arrangement (Figure 2D), a 2-pole switch (S_1-S_2) takes the place

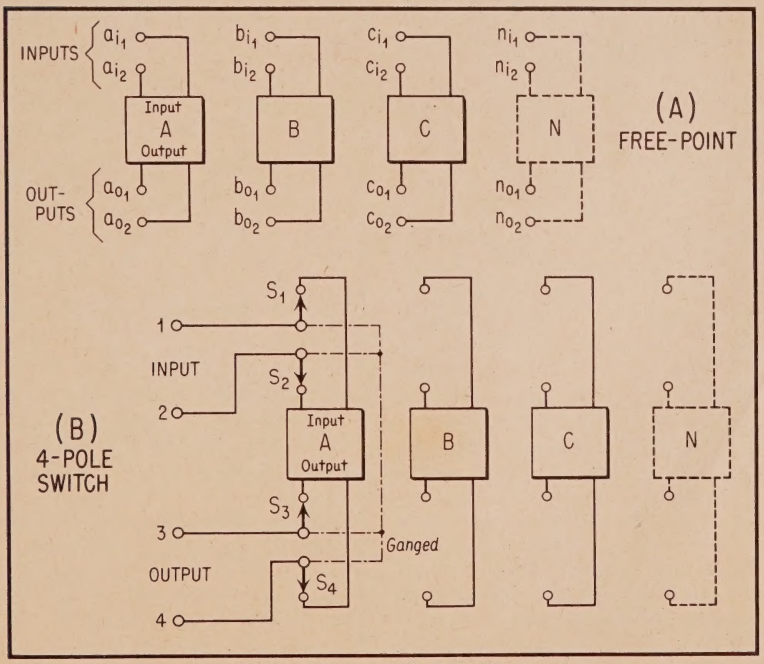


Fig. 3. 4-Terminal Configurations.

of the 3-pole switch required in Figure 2(C).

4-Terminal Configurations. Examples of 4-terminal units are transformers, saturable reactors, H and O attenuators, and bridge circuits. In most 4-terminal circuits, the input and output sections must be separated. This leaves no choice except to provide external access to both input and both output terminals.

Figure 3 shows the principal methods of connecting 4-terminal units in a substitution box. When the input and output terminals must be accessible separately, the free-point circuit of Figure 3(A) is available. The 16 required terminals are arranged in two rows on the panel. (Terminals a_{i1} and a_{i2} to n_{i1} and n_{i2} for the inputs, and a_{o1} and a_{o2} to n_{o1} and n_{o2} for the outputs). When internal switching is permissible, the circuit of Figure 3(B) is available. Here, the 4-terminal units (A, B, C . . . N) are selected with a 4-pole switch (S_1-S_2-S_3-S_4). Only four panel terminals (1 and 2 for the input; 3 and 4 for the output) are needed.

Sometimes, one input terminal (or one output terminal) of each component can be grounded. This is not true often enough, however, to justify running a common line inside the substitution box and elminating one row of terminals in Figure 3(A) or one switch pole in Figure 3(B). Similarly, it is possible in some applications to ground one input terminal and one output terminal of a 4-terminal device such as a transformer. But it is not advisable to make permanent common connections inside a substitution box containing 4-terminal components, since this will greatly limit the flexibility of the unit. The arrangements shown in Figure 3 therefore are the simplest for this type of box.

Practical Applications

This section describes the circuit details of several substitution boxes other than the familiar capacitor and resistor types. The usefulness of these boxes in circuit development and troubleshooting will be apparent to the engineer and technician. These boxes and others may be used in combination for special applications.

The values given for components are those which have been found most useful by the Editors. Other values may be substituted for greater utility in boxes built for individual applications.

Diode Box. See Figure 4. This substitution box has been designed to supply a choice between five of the

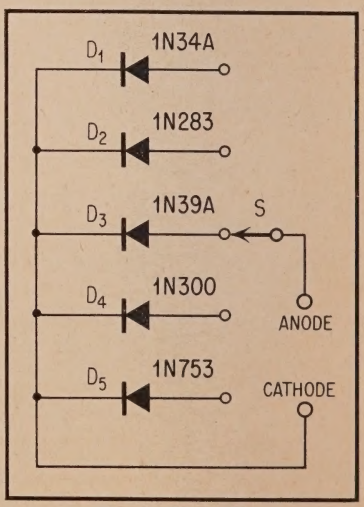


Fig. 4. Diode Box.

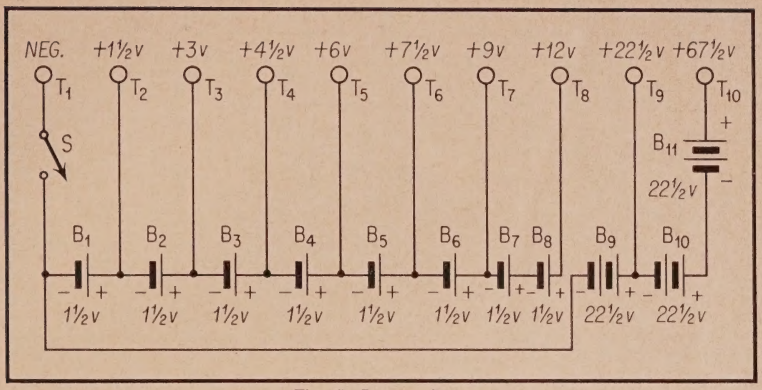


Fig. 5. Battery Box.

principal types of crystal diodes: general-purpose (D_1), high-conductance (D_2), high-back-voltage (D_3), silicon (D_4), and zener (D_5).

Diode D_1 (1N34A) is a standard, general-purpose unit. The important characteristic of D_2 (1N283) is its forward current of 200 ma at 1 volt. The reverse operating voltage of D_3 (1N39A) is 200 v. The silicon unit, D_4 (1N300) passes a reverse current of only 0.001 microampere at −10 v. Diode D_5 (1N753) is a zener reference unit for 6.2-volt operation.

For specific applications, diodes of other types may be used in place of those specified in Figure 4. Also, a greater number of diodes may be employed.

Battery Box. This unit, shown in Figure 5, is a d-c power supply as well as a voltage substitution box. Because two or more voltages often are required separately at the same time, the free-point type of circuit (with Output Terminals T_1 to T_{10}) is employed instead of a switching scheme. Nine voltages between 1½ v and 67½ v are supplied. Various other voltage values may be obtained between the positive terminals. For example, 45 v may be obtained between T_9 and T_{10}.

The batteries are small in size and the unit accordingly may be built in a medium-sized chassis box. B_1 and B_8 are 1½-volt, Size-D flashlight cells. B_9, B_{10}, and B_{11} are 22½-volt B-batteries (such as Burgess Type K-15).

Switch S opens or closes the circuit for any voltage taken between the NEGATIVE terminal and any other terminal.

The voltages specified in Figure 5 will satisfy most demands for bias and reference voltage substitution and for d-c supply for tube and transistor circuits.

Thermistor Box. See Figure 6. Six representative thermistors are arranged for selection by the single-pole rotary switch, S. These thermistors have the following nominal resistance values within ± 10%: R_1 38Ω, R_2 100Ω, R_3

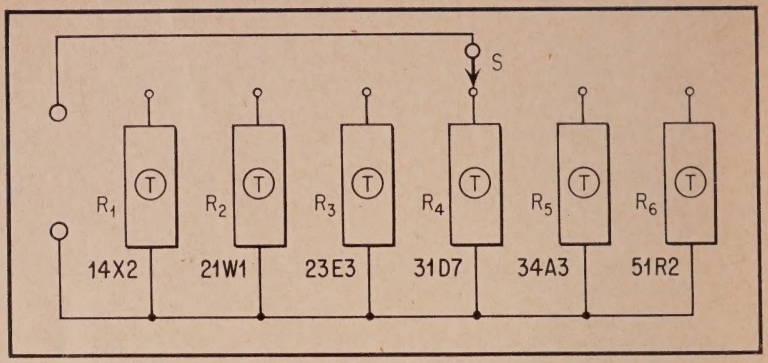


Fig. 6. Thermistor Box.

310Ω, R_4 1200Ω, R_5 3500Ω, and R_6 100,000Ω. All are Veco units; the manufacturer's type numbers appear in Figure 6.

The selected thermistors provide a wide range of uses in control circuits and stabilization networks. However, types having other resistances and temperature characteristics may be substituted for the ones shown. Also, more than six may be employed if a wider selection is desired.

Potentiometer Box. See Figure 7. This box has been found useful both in potentiometer and rheostat substitution and in the bench assembly of special circuits such as bridges. Five potentiometers are shown, since this number usually is the maximum which may be mounted in a small box with direct-reading resistance dials. The potentiometers are selected by means of a 3-pole rotary switch, S_1-S_2-S_3.

The potentiometers in a low-range box should have the following resis-

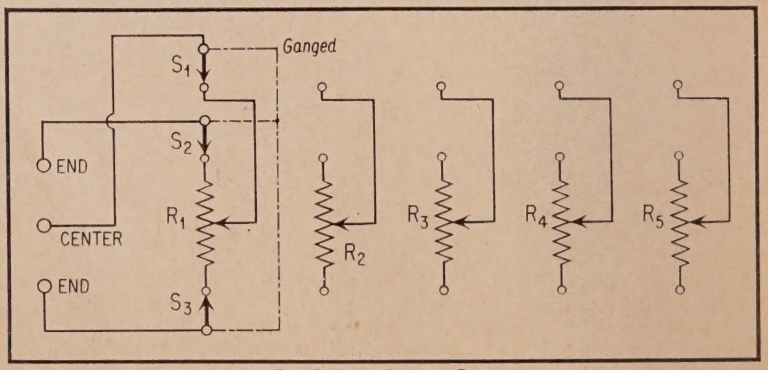


Fig. 7. Potentiometer Box.

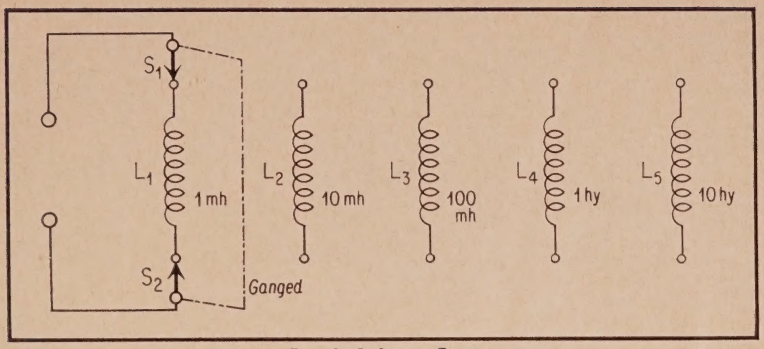


Fig. 8. Inductor Box.

tance values: R_1 50, R_2 100, R_3 200, R_4 500, and R_5 1000 ohms. Those in a medium-range box should be: R_1 5K, R_2 10K, R_3 20K, R_4 50K, and R_5 100K. Those in a high-range box should be: R_1 250K, R_2 500K, R_3 1 meg, R_4 5 meg, and R_5 10 meg.

Inductor Box. See Figure 8. A choice of five inductors (L_1 to L_5) is given, but more inductors might be added. For high Q and minimum interaction between coils, toroids are employed, except for L_1 which is a 1-mh pi-wound r-f choke (National R-300). The U. T. C. toroids are: L_2, 10 mh, Type MQB-1; L_3, 100 mh, Type MQE-7; L_4, 1 hy, Type MQA-12; and L_5, 10 hy, Type MQA-17.

In order to disconnect both ends of unused coils from the circuit, a 2-pole rotary switch, S_1-S_2, is employed.

Variable Capacitor Box. See Figure 9. This box permits a tuning range between approximately 5 uufd and 920 uufd. The 2-pole, 4-position,

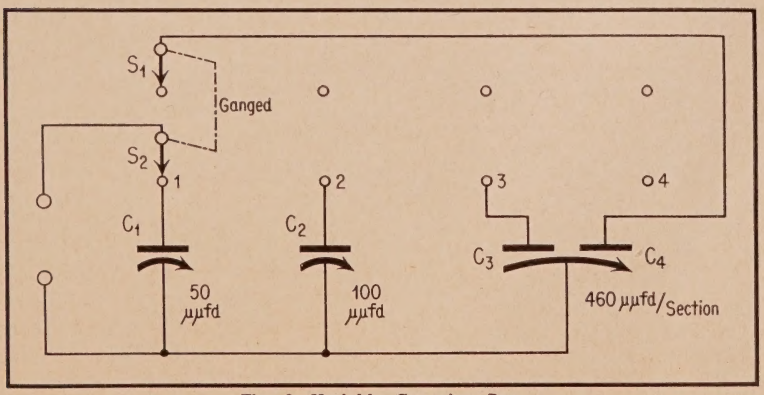


Fig. 9. Variable Capacitor Box.

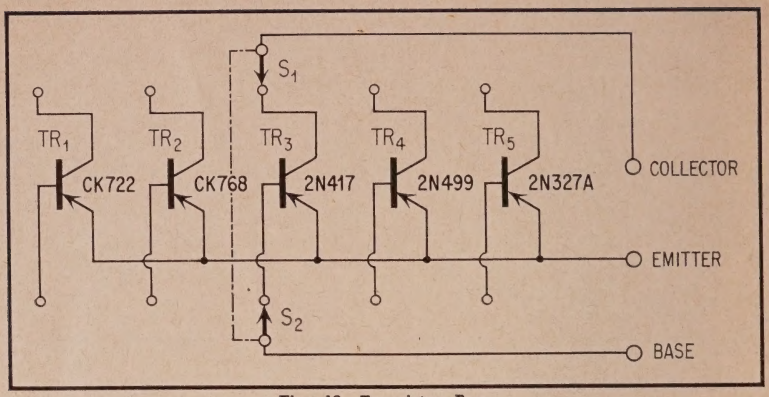


Fig. 10. Transistor Box.

rotary selector switch (S_1-S_2) in Position 1 selects the 50-uufd unit, C_1. In Position 2, the 100-uufd unit, C_2, is selected. In Position 3, one 460-uufd section of the dual capacitor, C_3-C_4, is selected. In Position 4, the two sections of C_3-C_4 are connected in parallel to give 920 uufd.

The capacitor dials may be made direct-reading in micro-microfarads. All wiring inside the box must be rigid and as short as possible.

Transistor Box. See Figure 10. Here, for the first time is a substitution box containing active elements. Five transistors are provided for a selection of useful characteristics from low-frequency audio performance to high radio-frequency operation.

While transistor types may be chosen according to particular demands of the user, the assortment shown in Figure 5 will cover most practical applications. TR_1 is a Ray-

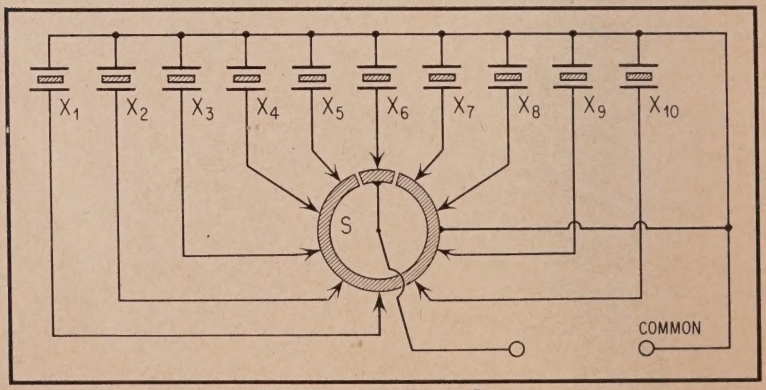


Fig. 11. Quartz Crystal Box.

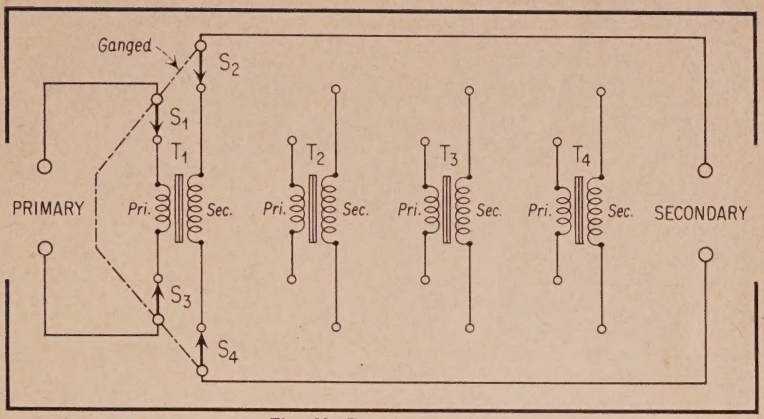


Fig. 12. Transformer Box.

theon CK722 general-purpose audio unit, TR_2 Raytheon CK768 af-if, TR_3 Raytheon 2N417 20-Mc cutoff, TR_4 Philco 2N499 250-Mc cutoff, and TR_5 Raytheon 2N327A silicon general-purpose.

All wiring inside the transistor box must be kept rigid and as short as possible. The emitters are connected together and to the EMITTER terminal post. The collectors are selected by Section S_1, and the bases by Section S_2 of the 2-pole, 5-position, rotary switch, S_1-S_2. If a power transistor is included, the switch must have contacts heavy enough to carry the high direct current, and a heat sink must be provided for the power transistor.

Quartz Crystal Box. See Figure 11. This box is invaluable as the frequency-shifting element of an experimental crystal oscillator. It also will provide a selected crystal for selective filter development.

Ten crystals (X_1 to X_{10}) are indicated and may be chosen in frequency to suit the requirements of the user. At least four should be low-frequency crystals (e.g., 50, 100, 455, and 500 kc) for standardization and i-f filter work.

A short-circuiting type, single-pole, ceramic selector switch (S) is employed. This switch short-circuits and connects to the COMMON terminal all crystals except the one in use. A suitable switch of this type is Centralab Type 2000.

All wiring inside the crystal box must be short and rigid.

Transformer Box. See Figure 12. In this box, both the primaries and secondaries of the transformers are switched simultaneously by the 4-pole rotary selector switch, S_1-S_2-S_3-S_4.

The transformer types may be chosen to satisfy the user's requirements which, of course, vary considerably among technicians. In order to minimize interaction between the units, only well-shielded transformers should be used in a substitution box. Unshielded units may be employed, with somewhat less suc-

cess, if they are mounted as far apart as possible and with their cores at right angles.

In order to minimize contact sparking, which eventually will ruin the selector switch, the power should be shut off in circuits before switching transformers in the substitution box.

RC-Network Box. Entire special-purpose networks may be switched in substitution boxes with the ease of switching single components. This is particularly true of resistance-capacitance networks, since they suffer very little from interaction and accordingly may be mounted close together in a box.

Figure 13 shows an example. Here, parallel-T null networks are switched. Each network may be set to a desired frequency notch by adjusting its R and C components. (R_1, R_2, R_3, C_1, C_2, C_3).

The common (ground-return) terminals of the networks are connected together and to the low OUTPUT terminal post. The input terminals are selected by Section S_1, and the output terminals by Section S_2 of the 2-pole rotary switch, S_1-S_2.

Additional Uses

Many other possible substitution boxes will sugggest themselves to the alert technician. Some examples are L-pad, T-pad, simple T-networks, bridged-T networks, semiconductor rectifiers, and Thyrite varistors.

Combinations of substitution boxes can save the busy experimenter a great deal of time ordinarily spent in soldering and unsoldering trial components. When considering a new substitution box, however, study the basic configurations given in Figures 1, 2, and 3 and discussed in the early part of this article, in order to determine the optimum arrangement for the box.

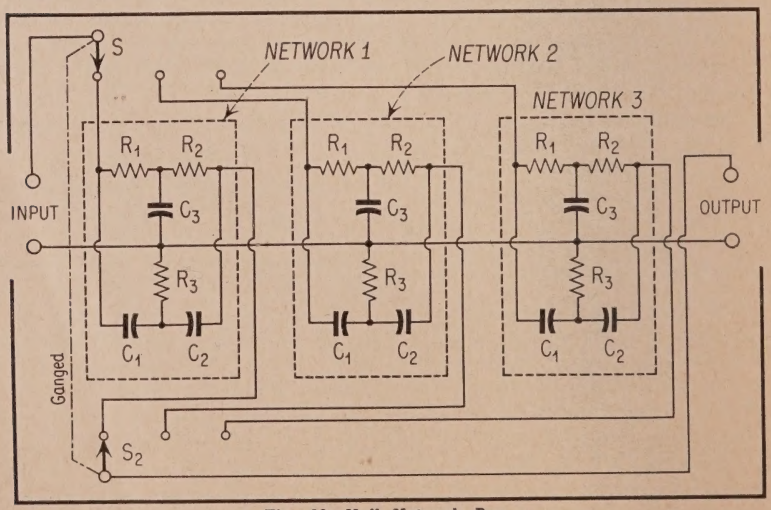
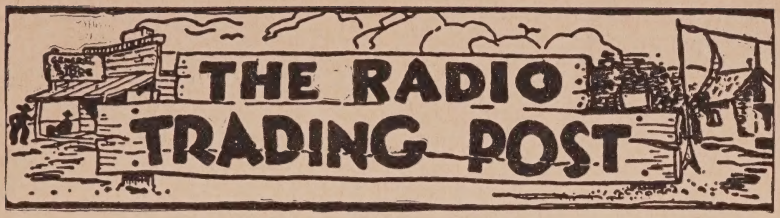


Fig. 13. Null Network Box.



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SELL OR TRADE — Elmac A-54 mobile xmitter VFO controlled; GE transformer 115/1200 VAC at 1.4 amps; two 813's and 4-125A's. Want cash or Collins 310-B. William Carson, 506 Newberne St., Lynchburg, Va.

FOR SALE — Radio BC-312-M rcvr., l. n., no backlash, converted to 110 v, include with original 2 books of diagrams and complete information, $95 plus shipping charges. Murray Schlein, 910 Dinsmore Ave., Far Rockaway 91, N. Y.

SELL OR TRADE — Stancor P3005, Utah 2291 transformers, Kennedy XV radio, Marathon 608 tubes, 6 and 12 v tubes. Want Emerson BD197, Neutrowound, Crosley 127 radios. C. E. Peters, 2925 Apple St., Lincoln 3, Neb.

SELL OR SWAP — Heathkit TC-1 and RCP 322A tube checkers, Heathkit 0-5 scope, Remington 10 standard typewriter, Coyne books. Want printing press, tape recorder, FM tuner or ? Bruno DeCola, 379 S. Broadway, Salem, Ohio.

FOR SALE — NRI TV-Radio Servicing course in excellent cond., books only, $25. E. Lau, 2 Evelyn Terr., Sayreville, N. J.

SWAP — Hallicrafter S40 shortwave and broadcast rcvr. 550 kc to 43 mc in good cond. for portable typewriter in good cond. Local preferred. Frank Manduca, 159 Withers St., Brooklyn 11, N. Y.

FOR SALE — Riders Radio books, Vols. 4, 5, 11, 12, 13, for $20 dollars fob. Milton Levis, 80 Elizabeth St., River Edge, N. J.

SELL OR SWAP — Riders manual Vols. 1 thru 13, except 4; Eico 360 sweep gen.; Jackson TVG2 sweep and marker gen. Best offer, all very good cond. William Porfilio, 49 Knox St., Springfield, Mass.

FOR SALE — Dumont 208-B late model 5" scope. H. M. Tremaine, 586 No. Windsor Blvd., Hollywood 4, Calif.

FOR SALE — Complete 2 meter xmitter, $55; Feret sig. gen., 100 mc. fundamental, $20; Magnavox 6 transistor radio, $38. All A-1. Also, xmitting tubes. R. Mickelson, 1342 W. Cornelia, Chicago, Ill.

WANTED — Manual on Assembly and Operation of Heathkit AR-2 Communications Rcvr. E. A. Ohm, 900 S. Chatham Ave., Elmhurst, Ill.

SWAP — RCA TV WR-39A xtal calibrator, A1 cond. for Hickok 533AP or 750 portable tube checker. S. Toufexis, 51-28 Reeder St., Elmhurst 73, N. Y.

FOR SALE — Several 6", 1 milliampere Triplett 626 meters with knife edge pointers, in original cartons, $10 each. R. Baron, 16619 NE 40th, Kirkland, Wash.

FOR SALE — Perfect fly back tester, only two connections with instructions, $12. Lester Wycoff, Marmaduke, Ark.

FOR SALE — Two way GE 148-174 mc reconditioned, tuned to taxi channel 4, complete, $150; BC645 with conversion inst., $25; Silver Vomax 900, $20; ARC5-T23 with tubes and xtals, $10; Carter dynamotor 6 v to 420 v @ 280 ma, $12; BC906D 150-235 mc freq. meter, $9. J. Wasiewicz, 74 Canterbury, White Plains, N. Y.

FOR SALE — Precision EV-20 VTVM, sensimeter, Philco S8200 portable scope, and Hickok 650 videometer with white dot attachment. Kenneth Stoll, Mt. Pulaski, Ill.

FOR SALE — Syltron 303 VTVM polymeter, $35; Heathkit AR-3 rcvr. with Q-multiplier, latest, aligned, $40; Lettine 240 xmitter, 2-160m, CW-fone, $50. Will ship. Jack Flanagan, 1249 Cambridge St., Cambridge, Mass.

FOR SALE — Eico VTVM fully wired and tested, used 3 times, excellent cond. with Uni Probe, model 232, $45 cash. Gerald Lemond, 8038 Eastern Ave., Bell Gardens, Calif.

FOR SALE — NRI Radio and TV course, complete with all lessons and kits, including multimeter, radio, and small parts, $50. Harvey Hiatt, R 2, Box 530, Mt. Airy, N. C.

FOR SALE — GI record cutter l. n. 78 recorder with two recording heads, chip chaser. Best offer over $35. Robert B. Bogdanski, 1604 Dorothy St., Scranton 4, Pa.

FOR SALE — Precise 907-K VTVM, $35 and 630-KA TV marker and bar gen., $38. Both calibrated and never used. E. D. Rogers, 308 Grata Rd., Knoxville 14, Tenn.

SELL OR TRADE — Philco sig gen., Clough-Brengle sig. gen., Supreme tube and battery tester, all in working order. Want good all band short wave rcvr. which operates on 110 v AC power with operating instructions. Ellison Radio Service, Centertown, Ky.

FOR SALE — Transvision 6 in 1 TV tester, $35; Kingston Probe-Master, $2.50; Sams TGL-7, $1. Robert Redd, Box 12, Union Furnace, Ohio.

FOR SALE — B and W 5100 xmitter with spare final tubes, less than 150 hours operation and in excellent cond., $225. John Donnelly, 330 31st St., Hermosa Beach, Calif.

FOR SALE — NRI multitester, AC powered with AC-RF head. Best offer. John Strazza, Jr., 48 Pulaski St., Bloomfield, N. J.

FOR SALE — NRI Professional TV Servicing course, complete with kits, $79.50; Heath V-7 VTVM, like new, $24.50; Precision 10-20P Tube and Set tester, very good, $42.50. No trades. M. Rafayko, 180 Winston, Lexington, Ky.

TRADE — RCA 7JP4 and TV tube caddy for late model RME Preselector. Sam Garshofsky, 78-42 264th St., Floral Park, N. Y.

TRADE — U-2 RCA two channel UHF converter for 10" K&E slide rule. William Warner, 5358 Big Tyler Rd., Charleston 2, W. Va.

WANTED — H.P. rig of good parts. Send list of all parts on hand. Seaman's, W. Macada Rd., RD 2, Bethlehem, Pa.

FOR SALE — Communication rcvr, Hallicrafter SX-100, complete with matching spkr., 5 months old, in very good cond., $210; Astatic xtal mike, $5; Vibroplex CW speed key, Champion model, $10. Marvin J. Potent, 808 Hurley Ct., Far Rockaway, N. Y.

FOR SALE — Heathkit AR-3 comm. rcvr., $40. Will ship. In very good condition. A. Halasz, 59 Alfred Terr., Randolph, Mass.

WANTED — Wiring diagram of DeForest Training, VOM. Have Vol. 9 TV Supreme publication for trade for Vol. 3-8-11 or 12. John S. Dewey, Osceola, Mo.

WANTED — Heath test equipment, any age, any condition, give lowest asking price. Tanrath-Suburban TV, 2110 Broadway, Rockford, Ill.

FOR SALE — Sylvania 220 tube tester in perf. condition, $75 COD. George Mavrick, 4316 Fullerton, Chicago 39, Ill.

WANTED — TV-FM sweep generator. Will trade 3-D camera or pay cash. S. Wellenc, 256-12th Ave., N. Tonawanda, N. Y.

SWAP — Browning Labs RJ-12 AM-FM tuner, for late model tube tester, Precision or Hickok. J. Phennicie, Jr., 1505 14th Ave., S.W., Cedar Rapids, Iowa.

FOR SALE — Knight ocean hopper, perf. cond., complete with cabinet, coils, and speaker, 155 kcs. - 35 mc., $10 postpaid. Fred Bernquist, Jr., 17 Peters Lane, No. Babylon, L. I., N. Y.

WANTED — Communication rcvr., reasonable, need not be in working condition. W. G. Fisher, 415 S.W. 11th St., Miami 36, Fla.

WANTED — Crosley PUP one-tube radio. Charles Larson, Ada, Kan.

WANTED — Plug in coil sets for Navy surplus HRO type rcvr., RAS-5, or CNA-46080. Herbert Greenberg, 821 Rutgers Rd., Franklin Square, N. Y.

WANTED — Revere push-button tape recorder, or Teltape, transistor, tape recorder. Eugene Kon, 1516 Broadway, Buffalo 12, N. Y.

FOR SALE — Tape recorder $30; unused NRI signal tracer $40. Ernest Beard, Rt. 1, Dematte, Ind.

WANTED — NRI or Cristy Appliance Repair course. Prefer NRI. What do you need? Ralph L. White, 76 Barber St., Springfield, Mass.

FOR SALE — 1955 Motorola color TV, $225; Simpson 488 field strength meter, $35; Hickok 600 tube checker, $45. Will trade for tubes, Sams, guns, or what have you. Bob Smathers, Box 948, Canton, N. C.

SELL OR TRADE — Hickok 203 vacuum tube volt-ohm-capacity-milliammeter in very good condition, recently calibrated with leads and manual. Le Roy Singer, 4 Atwood Rd., Plainview, N. Y.

FOR SALE — Heathkit 0-11 scope/demod., low cap. and direct probe, manual; Heath TS-4A TV alignment gen. xtal, leads, manual. Factory calibrated. Best offer. Peter Sheff, 55 Orange St., Hartford 6, Conn.

FOR SALE — C-D filter, projector, books. Want American Heritages, antiques. Will trade. H. Kuell, 138 Clinton Ave., Newark, N. J.

WANTED — Zenith radio case for Model 6-DO15. State price and cond. Frank Bakos, 2087 Kenmore Ave., Bethlehem, Pa.

FOR SALE — Jackson TVG-1 sweep and marker generator, good condition, $45 plus shipping charges. Robert Ditmer, 48 Orchard St., Englewood, Ohio.

WANTED — Wheatstone Bridge. Have Westinghouse panel meters Type DX, 0-300 amps DC, 0-300 VDC, 0-500 ma DC, Simpson 260, Precision 85, Sylvania 7" scope type 132, RCA Senior Voltohmyst type WV-97A, or cash (local only). S. Kacouros, 186 Front St., Secaucus, N. J.

FOR SALE — Like new Lampkin 103-B frequency meter, $120; 205-A FM modulation meter, $200. Other items at bargain prices, send for list. O. Kolen, 995 James St., Syracuse 3, N. Y.

SELL OR TRADE — Two BC-375-E transmitters, complete with coils, dynamotor, in orig. cartons; other electronic, photo, and misc. equip. Want marine depth indicator, test equip, or what? William Hanson, 165 Silverbrook, Niles, Mich.

WANTED — Inductance Bridge, Resistance Bridge, L & N Standard Resistors (four terminal) and laboratory type mirror scale meter with multiranges. Will trade audio equip., tape recorder, or pay cash. Harold Pallatz, Flemington, N. J.

WANTED — Heathkit TC-2 tube tester, MM-1 VOM, Eico 625 tube tester, or 565 VOM, each complete with instructions, either wired or partial, but with all parts. State prices. R. M. Bowman, 332 South Hays Ext'd., Jackson, Tenn.

WANTED — Altec 603B 15" speaker. R. Parris, 29 Charles St., Natick, Mass.

WANTED — Used Mopar radio for 1957-58 Plymouth in any condition. State model and lowest price. Jim Wong, 1475 Shotwell St., San Francisco 10, Calif.

WANTED — BC-348 receiver in good condition, converted to 110 v. AC. Prefer broadcast band conversion also. J. J. Sweeney, 923 Park Drive, Melrose Park, Ill.

WANTED FOR CASH — Collins 75A2 or 75A3 receiver. Gerald Goldstein, 188 Ten Eyck Walk, Brooklyn 6, N. Y.

SELL OR TRADE — Radio City flyback and yoke checker $33, or trade for signal generator. John Holiday, RD 2, Box 100, Indiana, Pa.

FOR SALE — Perfect Heath FM-3A and BC-1A tuners professionally wired and tested, $28 each; like new Heath 0-7 scope, $30; ARC-5, T20 and T21 xmtrs., $7 each; QST's 1932 thru 1948 complete, $30. Bob Schill, Box 412, Hinsdale, N. H.

TRADE — Hickok 170X, Knight capacitor checker, Eico 944, 950B, 221, Heathkit TC-2. Want SECO FB-4, 107, Sencore TRC4, Handy 36, and B&K CRT 350 or 400. Kenneth Miller, 10027 Calvin St., Pittsburgh 35, Pa.

FOR SALE — Science and Invention, Jan. 1930 to Mar. 1931; Radio News 1928 to 1941; Radio Craft 1931 to 1933; old issues of QST and CQ. M. J. Orofino, 2 Brookside Dr., Baldwin, N. Y.

SELL OR SWAP — Meissner 8C FM tuner in cabinet, with manual, for cash or what have you? C. Gabler, 1307 Merriam Ave., New York 52, N. Y.

SELL OR TRADE — Dumont scope 208 $45; RBM-4 receiver 200 kc., 2 mc., with power supply $35; tech manuals RAL-6, BD-72, GRC, VRC-6, BC348J, BC610, SCR-522, TS352, etc. Send for list. S. Consalvo, 4905 Roanne Drive, Washington 21, D. C.

FOR SALE — BC-348R in very good cond., new paint job, for $45, test equip., or what have you? Doug C. L'Hommedien, 17 Cady Ave., Nichols, N. Y.

FOR SALE — Zenith H725 AM-FM table model radio, $55 FOB; electronic door alarm, $15. Both like new. G. D. Griffin, 322 W. State St., Ithaca, N. Y.

SELL OR TRADE — AN/PRS-1 mine detector with spares, $25; AN/TRC-2 xmtr. and receiver with manual, $35. Want AN/ASQ-3 (MAD) gear. State price and cond. Stateside Radio & TV, 136 10th Avenue West, Kalispell, Mont.

WANTED — High power phone and CW transmitter, mobile all-band antenna, Heathkit AM-2 reflected power meter, coax 12 v. relay. A. Haberman, 129 Morgan St., Holyoke, Mass.

FOR SALE — Complete set Riders manuals, like new, from 1 to 22 plus one TV and one PA manual and bookcase for 12 manuals. Will sell all for $75 FOB. F. E. Hannula, 711 N. Penn Ave., Lansing 6, Mich.

WANT TO BUY — General Radio 650-A Impedance Bridge, state condition, age, and price. E. L. Withey, 22 Anselm Terr., Brighton 35, Mass.

SELL OR TRADE — Command sets T20, T21, BC457, BC458, complete or any part; RA10-FB receiver, complete less tubes and top cover plate; RF, AC, and DC panel meters. Ed Block, Grandview, Texas.

WANTED — Service manual or servicing information on Vornado automobile air conditioner (1958). Willing to pay any reasonable price. N. Lewis, 2941 Lardner St., Philadelphia 49, Pa.

FOR SALE — Wide-band video amp., $100; Channel 10 audio-video transmitter, $80; transformer 3000 v. CT, 1.25 a., 220 v. primary, $60; Chart Drive Echo sounder; L. F. pulse scope; sockets of all types. Harco Sales, 777 Bryant Ave., Winnetka, Ill.

FOR SALE — HF 10-20 converter RME, good cond., $40; 6' Par metal enclosed rack, $20; Heath Q multiplier, $7.50; XE-10 FM excitor, $10; 1200 v., 300 ma., panel mount neatly constructed home brew power supply, $15. J. V. Hellmann, 65-33 78th St., Middle Village 79, N. Y.

FOR SALE — GE ST-2A lab scope; Hickok tube tester; Eico electronic switch; NC-183D rcvr. and matching spkr.; Electro-Sonic cartridge 1 mil diamond and ESL-201 transformer. All in very good cond. S. R. Steinhorn, 1245 Westmoor Road, Winnetka, Ill.

FOR SALE — Electronic components, including scopes, tube testers, VOMs, VTVMs, other lab test equip., etc. Low prices. Write requirements. E. Harkness, 1825 Demptster, Evanston, Ill.

FOR SALE — GE K-85 all-wave radio and speaker, power transformers, three 812-H tubes, 60 ohm radar reactors, DM-28R 28 v. DC dynamotor, radar plate transformer, STD-50 condenser, old tubes. W. E. Jones, Box 4, Bowmansville, N. Y.

SELL OR TRADE — 36-key Teletype keyboard transmitter and 35-figure Teletype printer, 115 volts, made by "Teletype Corp." Want electronic or photo equip. Joseph Eberson, 2116 Morris Ave., New York, N. Y.

FOR SALE — Navy PA unit, portable, MC-364, model DS-3, 33 and 78 rpm, Astatic B2, plays 16" records, S12 arm, DN-HZ mike, spare tubes, 110 or 220 AC, speaker in cover, $50 FOB. M. J. Douglas, 1401 Amador, Concord, Calif.

FOR SALE — ATR inverter, 12", 110 AC, 60 v., 100 w. cont., 125 int., $25; Do-All TV gen. 740 with book, $15; Mallory 6VT1 vib. tester, new cond., all charts, $12. Mack Spizer, 6017 Mayflower Ave., Maywood, Calif.

WANTED — Panel mounts for Precision test equipment: E-200-C, E-400, EV-10A or 98-MCP. Clifford L. Burr, 24 Tremont Ave., Kenmore 17, N. Y.

FOR SALE — Heath TC-2P tube checker with TV picture tube adapter and acorn socket; Philco 7050 tube tester, needs modernizing. Best offer. Michael Bilgrei, 146 Hewes St., Brooklyn 11, N. Y.

FOR SALE — Rider's Radio Manuals, 5 to 13, Zenith Vol. 1 and 2, Ghirardi Radio Troubleshooter Handbook. Best bid in part or all COD. Stephen Barniak, 242b Perot St., Philadelphia 30, Pa.

WANT — Portable roll chart for Triplett tube tester No. 2413, etc. Interested in Hickok 600A or Triplett 3413. T. Ferguson, 171 E. 91 St., New York 28, N. Y.

WANTED — Jensen speaker, type HNP-51. State condition and price. R. Kopp, 311 Hamilton Ave., Silver Spring, Md.

WANTED — BC-453, TV rotator, 813's, Triband beam. Will sell or trade: 20 meter ground plane, fone patch, 10 meter quad, tubes, xformers, meters, etc. Send for list. W. Zmetronak, 147 Farview Ave., Paramus, N. J.

COLLECTOR'S ITEM — Like new Westinghouse (one unit) receiver tuner, type RA, detector amplifier type DA style 307190B, wave length 180-700, three WD-12 tubes. Best offer. Bob's Radio TV Service, 67 Lafayette St., Plattsburg, N. Y.

WANTED — Case for Crosley kitchen radio, model 10-135, white or color. Dawn MacDonald, 845 East 83rd St., Seattle 15, Wash.

FOR SALE — Dynamotor 12 v. input, 425 v. @ .375A out, $10, same except 6 v. input, $8; LM-10 freq. meter, like new with orig. calibration book, $50; Jones 120 w. Micro-Match SWR meter, $25. G. W. Carter, 8015 Loyola Boulevard, Los Angeles 45, Calif.

WANTED — Late issue RCA TV Servicing course or National Technical School instruction data on TV kit; Precision 111 tube tester. L. E. Salom, 724 Hunting Towers W., Alexandria, Va.

TECHNICIANS WANTED — Permanent positions in both New Jersey and Delaware by firm established 32 years. Charles W. Rogers & Son, Manasquan, N. J.

FOR SALE — DX100 transmitter in very good condition, A-1 tubes, a real performer, $170. R. S. Krebs, 1739 East Susquehanna St., Allentown, Pa.

FOR SALE — NRI Radio and TV Servicing correspondence course books, less parts but has assembled VTVM, $25 for both. R. Rivet, 64 Breslin Ave., Cohoes, N. Y.

WANTED — Magnetic cutting head for Federal disc recorder, overhead lathe type 16" recorder made in New York. Appreciate any info. Louis Venturelli, 131-14 131st St., So. Ozone Park 20, N. Y.

FOR SALE — Hammarlund HQ 140XA receiver with matching speaker, new in March, 1958, $150. Will not ship. John Priante, 2813 Avenue D, Brooklyn 26, N. Y.

WANTED — Temperature indicating electric meter with thermocouples for setting thermos on irons and frypans: Simpson, GE, J-B-T or equivalent, also instruction sheet. R. H. Banister, 1120 Main St., Wayne, Neb.

FOR SALE — Riders Vols. 2 to 17, very good condition; Riders TV Vols. 1 to 5. No reasonable offer refused. Shaker Radio & TV Service, 15519 Kinsman Rd., Shaker Heights 20, Ohio.

WANTED — RCA Victor 13K. Give price and condition. Al Schnitzer, Box 36, High Bridge, N. J.

SERVICE — Electronic kits wired and tested by experts, reasonable, quotations free. Michael A. Barone, 520 Avenue B, Redondo Beach, Calif.

FOR SALE — TC-55 tube tester, perfect, $18; Knight sweep generator with leads and 4.5 mc. crystal, $35; Superior 82 fast check tube tester, $30. All plus postage. W. A. Koehler, 131 Stratford Dr., Houghton Lake 12, Mich.

WANTED — Maintenance manual for a Model 561 Supreme signal generator. William Ungvarsky, 157 Hawthorne Ave., Yonkers, N. Y.

WANTED — Good quality Hi-Fi AM-FM tuner, must be a bargain or swap for unused intercom. system or West. Elec. amplifier. L. Buddine, 1700 West High St., Haddon Heights, N. J.

TRADE — Rolleicord 3 camera and case, Federal 311 enlarger and case, misc. darkroom equipment, for good capacity checker, i.e., Cornell-Dubilier BF-60 or BF-70 and Hi-Fi equipment. Local only. Bernard Arkenau, 23 Berwyn St., East Orange, N. J.

FOR SALE — Complete CIRE Master course with advanced TV training, leading to FCC first phone ticket, 1st class cond., $125 FOB. Bart B. Bonney, 86 Pennsylvania Ave., Coatesville, Pa.

WANTED — Alignment and operating manual for Bendix MRT-3B Communicator. State price first letter. Herb Ailing, 219 South Wooster Ave., Strasburg, Ohio.

SELL OR SWAP — Lafayette LSG-10 sig. gen.; Eico 1100 RTMA resistance box, and 1120 capacitor substitution box; Bud WO-6-A phono oscillator, all like new. Need Heath FM and AM tuners, or equivalent. Jack Himelfarb, 6402 24th Ave., Brooklyn 4, N. Y.

FOR SALE — 26 volumes Sams Photofacts; TO-4 Tel-ohmike capacitor analyzer; model 123 flyback; 100A selenium rectifier tester; also all Hickok: 670 scope, 610A sig. gen., and 533A tube tester. Make offer. H. C. Maxwell, Oxford Radio & TV, Wall St., Oxford, N. J.

FOR SALE — Panadaptor PCA-2, manufactured by Panoramic Radio Corp., in very good condition, $50. L. W. Van Slyck, 406 Bon Air Temple Terr., Tampa 10, Fla.

FOR SALE — Two CBS 19" color TV sets, not in working condition. Make offer. Don Furman, Box 230, Port Washington, L. I., N. Y.

FOR SALE — 1001 items TV-radio parts, tube testers, service magazines, sold as a whole. L. Phillips, 2130 East 19th St., Brooklyn 29, N. Y.

FOR SALE — Rider's Radio Manuals 1 thru 16, first five original, unabridged, $75, plus freight. E. H. Meadows, 3912 Maryland Ave., Shreveport, La.

FOA SALE — Philco 16", $35; Admiral 1958 portable 17", $90; Motorola 21" aluminized CRT, $90; GE 17", $65; Regal 630 16", $50; Admiral 10", $20. All in perf. working cond. Harry's TV Service, 120-51 232nd St., Cambria Heights 11, L. I., N. Y.

FOR SALE — NRI RC bridge type tester 113, in new condition, $25. Brian Chin, 22 Mulberry St., New York 13, N. Y.

SELL OR TRADE — Complete RTI Radio and TV course, theory and lab instructions, for electric train sets, Lionel or HO. R. Davidson, 87-10 204th Street, Holliswood 23, N. Y.

FOR SALE — Gonset Super 6 with twin noise squelch, 15 w. mobile transmitter, compact and placarded, 10 meter whip, vibrator power supply 300 v. @ 100 ma., all instructions, all 6 v. units, $45. M. Vassallo, 99 Greenpoint Ave., Brooklyn 22, N. Y.

SELL — BC-696, $15; Viking Ranger, $190; HQ-140X, $185; BC-221, $75; Rolleicord V, orig. carton, leather case, $75; Kodak Retina wide angle lens and view finder, $40. All A-1 cond. I. Seidman, 1535 Longfellow Ave., Bronx 60, N. Y.

FOR SALE — Supreme 599-A combination tube tester, VOM and battery checker, with instructions, very good condition, only requires latest roll chart, $30. Arnold Herman, 1238 West Bryn Mawr Ave., Chicago 40, Ill.

FOR SALE — Two tube and tool caddies, $2.50 each; six-volt battery eliminator, $8. Paul Blaustein, 1917 Mulberry St., Toledo, Ohio.

FOR SALE — Good 3" Pilot TV set, make offer; RMS booster $5; Bogen $2, as is; good 120-base accordion with case $75 prepaid. Have tubes to swap. Send for list. J. Andrews, 740 Maple Street, Bethlehem, Pa.

FOR SALE — Webster Teletalk 12 station intercom, model 212UM, very good cond. Best offer. W. Parkinson, 48 Union St., Valley Stream, N. Y.

CLOSEOUT SALE — HI-FONE Wireless intercoms in factory cartons at unheard of low price; also parts for assembly. Info sent on request. Paul Harris, 9421 North Kildare, Skokie, Ill.

SWAP OR SELL — Mobile power supplies for xmtrs and rcvrs, high and low voltages. Want rifles, revolvers, shotguns, shooting accessories, spotting scope. Leon A. Wortman, 10 Downing St., New York 14, N. Y.

FOR SALE — Gonset Model D 12 v. Super-Six converter, $33; stainless-steel whip antenna, with base mount, $12. Both in good cond., $40 for both. Interested in mint-condx SX28A. Joseph F. Dineen, 9 Winter Terr., Westwood, Mass.

WANTED — Lampkin 105B frequency meter and Bird wattmeter. Merton Iwerks, PO Box 44, Forest City, N. C.

TRADE — Signal gen., tube tester, service osc., xmitter and power supply (postage prepaid East of Mississippi River), for two Vocaline units in working order. George Ledoux, 23 Walker Rd., New Britain, Conn.

TRADE — T23 xmitter 100-156 mc. partly converted, for GDO, antenna tuner, 6 meter convertor, modulation transformer, amplifier, power supply, fil. trans., RG-58U lo pass fil., SWR bridge with meter. Arthur Ideker, 1505 W. 14th, Pine Bluff, Ark.

WANTED — Old-style European French telephone in working condition. Swap for modern dial phone in color. Robert Cobaugh, 29-29 213th St., Bayside 60, N. Y.

FOR SALE — Sonotone 12" coaxial spkr., like new; Knight kit R/C tester, completely wired and tested; Fisher hi-lo filter in original carton. Best offer. P & R Television, 5 Market St., Northampton, Mass.

FOR SALE — Expertly assembled Dynakit preamp., $30; Leak pickup with both LP and 78 heads plus transformer, like new, $35. Will ship prepaid. Kenneth Massey, 3449 Winthrop Ave., Indianapolis 5, Ind.

FOR SALE — Complete ham station: DX-20 $30; S-53A with QF-1, both like new, $80, or $75 for S-53A alone. Items sold separately, or $100 takes all. Stan Kosciuk, 206 Hawthorne Ave., Newark, N. J.

WANTED — Hallicrafter S-76 communication receiver, must be in A-1 condition, low priced. Will pay cash. C. S. Brotzman, 33 Main St., Mexico, Maine.

SELL OR SWAP — Ampro Premier "20", 16 mm sound projector with speaker. Want late model receiver, HQ-100, HQ-110, etc. B. A. Skurnowicz, Gouldsboro, Pa.

FOR SALE — Rider manuals 6 thru 8, 11 thru 14; Sams 1 thru 159 in 13 binders, very good condition. Sell all for $296 COD. J. A. Y. Radio and TV, 100 Ethel Ct., Walled Lake, Mich.

FOR SALE — Mosely VPA20-3, 3 element vest pocket beam for 20 meters, 7.5 db forward gain. Will deliver within radius of about 50 miles for $50 cash. Lou Tonik, 1204 Passmore St., Philadelphia 11, Pa.

SELL — Supreme 599 tube and set tester, reads AC-DC volts, ohms, current, etc., in very good condition, original owner, $35 cash. Ed Howell, Folly Beach, S. C.

SELL OR TRADE — Two broadcast type RMC vertical transcription pickups and equalizers; two 16" lateral transcription arms; two three-speed turntables; ATR 6-110 v. inverter, 150 watts; GE portable radio, wet battery. Glen Barnett, Box 28, Webster City, Iowa.

FOR SALE — DX35 with VFO, like new, $50; 6 meter Gonset converter in very good cond., $35; 6 meter Harvey-Wells modulator, needs work, $25. Carl Nevlin, 2403 College, Alton, Ill.

TRADE — First day American covers, good condition, for scope, VTVM signal gen. Send for list. A. Brandwein, 306 West 100th St., New York, N. Y.

FOR SALE — National NC-240-D, with speaker, $100; Harvey TBS-50-D with power supply, $90; WRL 755 VFO, $25; RME HF10-20, $35. Bob Evans, Box 38, Wayland, Ohio.

SELL OR TRADE — 10-M5 Astatic carbon mike, LM frequency standard with AC supply and calibrations, 6 volt G.M. 55 amp. generator and regulator, Hi-Fi Dynamic handset, all like new condition. Need HD rotator and Millen grid dipper in A-1 cond. Frank Guetter, Orland Park, Ill.

FOR SALE — Power xformer, 115 v., 60 cycle output 1120 v. CT @ 0.5 amp; 6.3 v. @ 3A and 0.3A; 5 v. @ 6A and 2A, $8.50 each. S. S. Brody, 211-10 73rd Ave., Flushing 64, N. Y.

SELL OR TRADE — Supreme 504-B tube tester; Feiler TS-3A electronic stethoscope; Heathkit VT-1 vibrator tester; Superior 450 tube tester. All in good working order. Want good 8 mm movie projector. Bill's Electric, Sharon Springs, Kan.

FOR SALE — Pilot AF860 AM-FM tuner, $80; Harmon Kardon AM-FM tuner, $30; Altec 604C speaker in Karlson-Blond formica enclosure, $150; other equipment. Local only. S. D. Kaufman, 23 Donna Rd., Newton Center, Mass.

SWAP — Completely wired 1 kw. power supply, Stancor P-8035 trans., 500 ma., 4 kv - 5 kv. CT, UTC 37 choke, UTC 38 swing choke, UTC 2.5 trans., bleeder, 3 kv conds., for small comm. CW-phone transmitter, or tape recorder. E. Taffe, Jr., 222-3rd St., Palisades Park, N. J.

FOR SALE — Magazines: Electronics Digest Nov. 1954 to Aug. 1955 and Popular Electronics Oct. 1954 to Aug. 1958. Best offer. John Hrinda, 1379 Stewart Street, Northampton, Pa.

WANTED — Schematic or operator's manual for power pack of TG-31 Signal Corps repeater key telegrapher. State price. John Puttress, 6310 Winthrop, Detroit 28, Mich.

FOR SALE — Hickok VOM 209A; Sprague T0-3; EMC battery charger and eliminator with vibrator tester 6 and 12 volt; Hickok 605A tube and set tester; Jackson 641 Universal sig. gen. All like new. Harry Galewski, 155 W. 4, Winona, Minn.

FOR SALE — Knight in-circuit capacitor checker with instruction book, wired ready for service, $10. William M. Hutchinson, 28 Box Ave., Buffalo 11, N. Y.

WANTED — Philco TP400A projector tube in good condition. Will pay $10. C. Wachspress, 78-15 68th Road, Middle Village 79, N. Y.

FOR SALE — Fund. of Vac. Tubes, Eastman, 3rd Ed., unused, $4. L. Matushefske, 2 Elmont Rd., Elmont, L. I., N. Y.

SWAP — Hallicrafter S40A receiver, good condition, for portable typewriter. Local preferred. Frank Manduca, 159 Withers St., Brooklyn 11, N. Y.

WANTED — Output transformer T102 for National RBL receiver from spares kit. H. Foerster, 1321 East 66th St., Seattle 15, Wash.

TRADE — All sizes power transformers and tubes, OA2, 6AL5, 12AV7, etc., for whip antenna, mount, and 40 meter coil or PE-103A or other ham gear. Please state. Nick Moran, c/o Iola Hospital, Rochester 20, N. Y.

FOR SALE — Eico HFT-90 FM tuner, like new, fully wired and tested, $49 FOB, less cover. N. P. Forcier, Haynes Ave., Middleton, Mass.

WANTED — RCA U-20 radio chassis only. State price, condition. Bill Messina, 43 Wentworth St., Boston 24, Mass.

FOR SALE — Hammarlund HQ129X rcvr in very good cond., $125. Morton Goldman 1530 S.W. 22nd Terr., Miami 45, Fla.

FOR SALE — Heathkit BR-2 broadcast receiver with cabinet, completely built and aligned, very good condition, excellent sensitivity, not used over 10 hours, $24. Brad Lentz, Phi Gamma Delta, Crawfordsville, Ind.

FOR SALE — Longine Wittnauer varsity wrist watch, like new condition, $50, or trade for Hallicrafter S38 or S38A, B, C, D, or E. Clifton Johnson, 3705 Swift St., San Diego, Calif.

FOR SALE — Up-to-date TD-55 tube tester, $20. E. Prescott, 2616 Bloomington Ave. South, Minneapolis 7, Minn.

SELL OR TRADE — Atwater-Kent breadboard type radio, 1923 model, good condition, for cash or for good Bar-dot generator for color TV convergence. E. E. Hamrick, P.O. Box 21, Ft. Gaines, Ga.

FOR SALE — Precision 10-12 tube tester, $30; Eico 232 VTVM, $20; Sprague quick test KT-1, $10; guaranteed TV course, $3; TV Cylopedia, $2; Audel's Appliance Servicing, $3. Virgil Kramer, Box 834, Burwell, Neb.

SELL OR TRADE — Eico 625 tube tester, 352 bar generator, obsolete hard-to-find tubes, UHF strips and converters. Want sweep and/or marker generators. Beach Radio, 2715 North Water, Corpus Christi, Texas.

WANTED — Batt. eliminator; sweep gen.; CRT checker, Heath preferred; Wallace Telaides. Sell or trade Heath SG-8 sig. generator. John Smart, 626 Evans St., Newark, Ohio.

WANTED — Complete instructions and manual for Sylvania 400 television scope. Charles Blunt, 6235 Germantown Ave., Philadelphia 44, Pa.

SELL OR TRADE — One camera tube (RCA Image Orthicon No. 5820) from TV studio camera, in carton, used, but still works, guaranteed. Interested in battery eliminator, 12 v. type. Philip Koch, 3534 Connecticut St., St. Louis 18, Mo.

SELL OR TRADE — Over $200 worth of radio parts, etc., for $80, request list; Heath GD-1B grid dip, extra coils, $20. Want stereo Hi-Fi equip. J. Volk, 421 Shirley Ave., Buffalo 15, N. Y.

SELL OR SWAP — ART-13; Bandmaster Deluxe TBS-50D with APS-50 power supply, VFO, covers 160 to 2 meters; 100 PI-48's, BC-645's, MD-7's, 1" scope tubes. Mike Raymond, 4046 Iroquois St., New Orleans 26, La.

SELL OR TRADE — About 250 radio tubes, a few TV, all cartoned, mostly standard brands. Want old U.S. coins or sell below wholesale. Send for list. Also two antique radios, cheap. Harold Garrett, 711 South New York, Sedalia, Mo.

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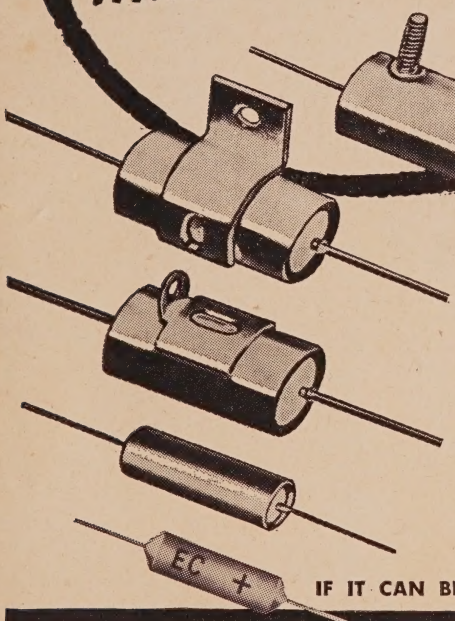

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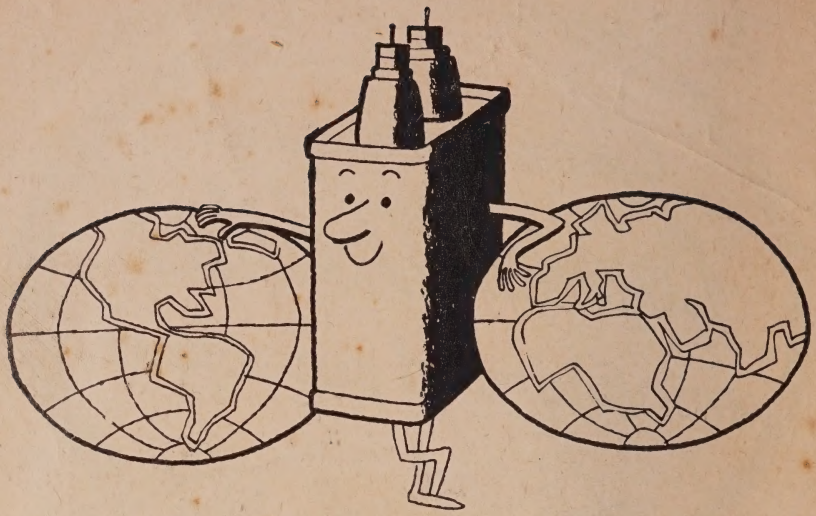

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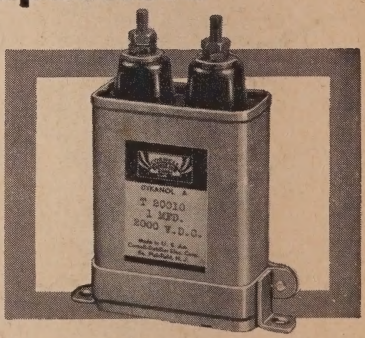

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